

Claims 1-31 stand rejected under 35 U.S.C. §102(e) as allegedly being anticipated by IRWIN. Claims 1, 2, 6, 9, 14 and 19-20 have been canceled by the present amendment. The rejection of these claims is, therefore, moot. Applicants traverse the rejection of the remaining claims and respectfully submit that IRWIN fails to anticipate claims 3-5, 7, 8, 10-13, 15-18 and 21-31.

IRWIN discloses a system for performing an address lookup in a packet data communication system that consists of a lookup table module (RAM) 66, a binary search module 62, an associative search module (CAM) 64, an address multiplexer (MUX) 70 and a descriptor memory 68 (see FIG. 4). A 32-bit destination address is retrieved from a received packet and one portion of the destination address is subject to a search algorithm in lookup table module 66 and a masked portion of the destination address is subject to a search algorithm in the associative search module 64 directed by the binary search module 62 (see column 6, lines 38-43). Lookup table module 66 provides a 16-bit binary decoding tree and associative search module 64 provides an associative search of network addresses that are stored in "bins" that have a specific prefix value (see column 6, lines 53-57).

With an incoming packet destination address (IDA) 80 that consists of four address bytes (n1.n2.n3.n4), where n1 is the most significant byte, bytes n1.n2 are used to address lookup table module 66 (see column 7, line 65 – column 8, line 4) to retrieve a prefix search list 82 (see column 8, lines 18-22). The prefix list is searched by binary search module 62, resulting in a recursive depletion of the prefix search list 82 that further may result in the longest matching prefix being found (see column 8, lines 64-67). The longest matching prefix is then used to generate a network address search value (SV) 84 from the full destination address (n1.n2.n3.n4) (see column 9, lines 11-28). The generated network search

address value is presented to associative search module 64 so that module 64 can make an associative comparison to all entries in the CAM of module 64 to find a matching network address (see column 9, lines 15-18). A lower pointer 88 represents the location of the matching network address found in the CAM of module 64 (see column 10, lines 1-4). An upper pointer 90 is also defined by the n1.n2 bytes of the destination address as used to read the lookup table in the RAM of module 66 (see column 10, lines 9-12). Binary search module 62 selects either the lower pointer 88 or the upper pointer 90 for passing to address MUX 70 as a pointer selection (see column 10, lines 11-14). The pointer selection is used to retrieve an address from the CAM of module 64 to address a data table in descriptor memory 68 (see column 10, lines 13-16). Forwarding data used to route the packet having IDA 80 is retrieved from the addressed locations in descriptor memory 68 (column 10, lines 20-24). IRWIN, thus, discloses the use of a first set of bits (n1.n2) of a packet's destination address for performing a lookup in lookup table module 66 and a second set of bits (n1.n2.n3.n4) for generating a search address value that is used for performing a lookup in the CAM of module 64 for determining forwarding data used to route the packet.

In contrast to IRWIN, claim 4 recites a number of features, including, for example, "selecting a third one of the storage locations based on contents of the second selected storage location *and a third set of bits contained in the header data*" (emphasis added). IRWIN does not disclose or suggest this feature of claim 4. The Office Action asserts that the above-recited feature of claim 4 is disclosed by IRWIN, alleging that "if n3 is not the longest match, the n4 or the prefix value /20 is selected, column 6, lines 5-17" (Office Action, page 3). Applicants note that the portion of IRWIN cited by the Office Action merely gives an overview of how a packet is transmitted along a path that includes the

greatest number of ones in the address masked by a prefix mask. As is apparent from the discussion above regarding the specific algorithm of IRWIN, IRWIN discloses the use of a first set of bits (most significant bytes n1.n2) and a second set of bits (all address bytes n1.n2.n3.n4) of the destination address from the packet header for packet forwarding and does not specifically disclose the selection of a third storage location based on contents of a second storage location and a third set of bits contained in the header data, as recited in claim 4. IRWIN, therefore, does not anticipate claim 4. Withdrawal of the rejection of claim 4 under 35 U.S.C. §102(e) is, thus, respectfully requested.

Claims 3 and 5 depend from claim 4. Withdrawal of the rejection of these claims is, therefore, respectfully requested for at least the reasons set forth with respect to claim 4 above.

Claim 10 recites, among other things, "employing a third set of bits from the destination address as an index to locate a third entry in the third forwarding lookup and employing the contents of the third entry in forwarding the packet." The Office Action cites the same portion of IRWIN as discussed above with respect to claim 4. As discussed above with respect to claim 4 above, IRWIN merely discloses the use of a first set of bits (n1.n2) and a second set of bits (n1.n2.n3.n4) of the destination address from a packet header and does not specifically disclose employing a third set of bits from the destination address as an index to locate a third entry in a third forwarding lookup, as recited in claim 10. IRWIN, therefore, does not anticipate claim 10. Withdrawal of the rejection of claim 10 under 35 U.S.C. §102(e) is, thus, respectfully requested.

Claims 7, 8 and 11 depend from claim 10. Withdrawal of the rejection of these claims is, therefore, respectfully requested for at least the reasons set forth with respect to claim 10 above.

Claim 12 recites, among other things, "employing...a third set of bits in the destination address to locate and access at least one location in the third forwarding lookup to forward the at least a portion of the data packets." The recited "third set of bits" is similar to that discussed above with respect to claims 4 and 10. Applicants, therefore, respectfully request withdrawal of the rejection of claim 12 under 35 U.S.C. §102(e) for at least the reasons set forth with respect to claims 4 and 10 above.

Claim 13 depends from claim 12. Withdrawal of the rejection of claim 13, therefore, is respectfully requested for at least the reasons set forth with respect to claim 12 above

Claim 15 recites "using a third set of bits from the header data of each received packet as an index to locate an entry in the third lookup structure..." that is similar to the feature discussed above with respect to claim 10. Applicants, therefore, respectfully request withdrawal of the rejection of claim 15 for at least the reasons set forth with respect to claim 10 above.

Claims 16-18 depend from claim 15. Withdrawal of the rejection of claims 16-18, therefore, is respectfully requested for at least the reasons set forth with respect to claim 15 above.

Claim 21 recites a combination of features including "a third lookup array containing entries indexed by a set of trailing bits that follow the successive set of bits in the destination address for IP packets, each entry containing an instruction to assist in forwarding an IP packet." The Office Action rejects this claim for the same reasons as discussed above with

respect to claim 10. As discussed above with respect to claim 10, IRWIN merely discloses the use of the most significant bytes (n1.n2) and all the bytes (n1.n2.n3.n4) of the destination address from the packet header and does not specifically disclose a third lookup array containing entries indexed by *a set of trailing bits* that follow *a successive set of bits* that follow *leading bits* of the destination address, as recited in claim 21. IRWIN, therefore, does not anticipate claim 21. Withdrawal of the rejection of claim 21 under 35 U.S.C. §102(e) is, thus, respectfully requested.

Claims 22 and 23 depend from claim 21. Withdrawal of the rejection of claims 22 and 23, therefore, is respectfully requested for at least the reasons set forth with respect to claim 21 above.

Claim 24 recites, among other things, “wherein the second one of the storage locations provides a location, in conjunction *with a third set of multiple bits from the header data*, of a third one of the storage locations, wherein the third one of the storage locations provides an instruction regarding how the device should forward the network layer packet” in which the “third set of multiple bits from the header data” is similar to the feature discussed above with respect to claim 10. Withdrawal of the rejection of claim 24, therefore, is respectfully requested for reasons similar to those set forth with respect to claim 10 above.

Claims 25-28 depend from claim 24. Withdrawal of the rejection of claims 25-28, therefore, is respectfully requested for at least the reasons set forth with respect to claim 24 above.


Claim 29 recites, for example, “using a prefix of multiple bits from the destination address of the IP packet as an index to locate a first entry in the first forwarding lookup wherein the first entry in the first forwarding lookup provides direction to the second

forwarding lookup, using a next sequential set of bits following the prefix in the destination address as an index to locate a second entry in the second forwarding lookup.” As discussed above with respect to claim 4, IRWIN merely discloses the use of the two most significant bytes (n1.n2) and all the bytes (n1.n2.n3.n4) of the destination address from the packet header in its algorithm for packet forwarding. IRWIN does not disclose, or even suggest, “using a prefix of multiple bits from the destination address” and “a next sequential set of bits following the prefix in the destination address” for packet forwarding as recited in claim 29. IRWIN, thus, does not anticipate claim 29. Withdrawal of the rejection of claim 29 is, therefore, respectfully requested.

Claims 30-31 depend from claim 29. Withdrawal of the rejection of claims 30-31, therefore, is respectfully requested for at least the reasons set forth with respect to claim 29 above.

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's reconsideration of this application, and the timely allowance of the pending claims. To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 07-2339 and please credit any excess fees to such deposit account.

Respectfully submitted,

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MARKED-UP VERSION OF AMENDMENT SHOWING CHANGES MADE

*Claims 3-5, 7, 8, 10-12, 15 and 24 have been amended as follows:*

3. (Twice Amended) The method of claim [2] 4, further comprising the step of forwarding the network layer packet based on the contents of the [second] third selected storage location.

4. (Twice Amended) [The method of claim 2, further comprising the step of] In a device for forwarding data packets, the device having a memory containing storage locations, a method comprising:

receiving header data of a network layer packet;

selecting a first one of the storage locations based on a first set of bits contained in the header data; and

executing an instruction at the first selected storage location;

selecting a second one of the storage locations based on the executed instruction and a second set of bits contained in the header data; and

selecting a third one of the storage locations based on contents of the second selected storage location and a third set of bits contained in the header data.

5. (Amended) The method of claim [1] 4 wherein the packet is an IP packet.



7. (Amended) The method of claim [6] 10 wherein the step of employing the contents of the second entry comprises executing an instruction contained in the second entry to forward the IP packet toward the destination address.

8. (Amended) The method of claim [6] 10 wherein the first entry contains an instruction to use the second forwarding lookup.

10. (Twice Amended) [The method of claim 9 wherein the method further comprises the steps of] In a device for forwarding an Internet Protocol (IP) packet toward a destination having a destination address containing a sequence of bits, a method comprising:

using a first set of bits from the destination address of the IP packet as an index to locate a first entry in a first forwarding lookup;

where the first entry in the first forwarding lookup provides direction to a second forwarding lookup, using a second set of bits from the destination address as an index to locate a second entry in a second forwarding lookup;

employing contents of the second entry in forwarding the IP packet, wherein employing contents of the second entry comprises identifying that a third forwarding lookup should be used in forwarding the IP packet; and

employing a third set of bits from the destination address as an index to locate a third entry in the third forwarding lookup and employing the contents of the third entry in forwarding the IP packet.

11. (Amended) The method of claim [6] 10 wherein the device includes an application specific integrated circuit (ASIC) and wherein the ASIC performs the steps of the method.

12. (Twice Amended) In a switch having a memory in a network that employs a connectionless network protocol, a method of forwarding [a] data packets, each having an associated destination address comprising [the steps of]:

providing a first forwarding lookup, a second forwarding lookup and a third forwarding lookup with locations in the memory, wherein the locations are indexed by a multiple bits; and

for at least a portion of the packets [each data packet] to be forwarded, employing a first set of bits in the destination address to locate and access at least one location in the first forwarding lookup, a second set of bits in the destination address to locate and access at least one location in the second forwarding lookup and a third set of bits in the destination address to locate and access at least one location in the third forwarding lookup to forward the at least a portion of the data [packet] packets, wherein the number of bits in any of the first, second and third set of bits is less than the total number of bits in the destination address.

15. (Twice Amended) A device for forwarding received network layer packets wherein the packets include header data, comprising:

a first lookup structure storing entries that provide instructions regarding forwarding of network layer packets, said entries being indexed by multiple bits; [and]

a second lookup structure storing entries that provide instructions regarding

forwarding of network layer packets, said entries being indexed by multiple bits;

a third lookup structure storing entries that provide instructions regarding forwarding of network layer packets, said entries being indexed by multiple bits; and

a forwarding controller for using a first set of bits from the header data of each received packet as an index to locate an entry in the first lookup structure and for executing the instruction stored at the located entry in the first lookup structure, for using a second set of bits from the header data of each received packet as an index to locate an entry in the second lookup structure and for executing the instruction stored at the located entry in the second lookup structure and for using a third set of bits from the header data of each received packet as an index to locate an entry in the third lookup structure and for executing the instruction stored at the located entry in the third lookup structure.

24. (Twice Amended) In a device for forwarding data packets wherein the device includes a storage having storage locations, a computer-readable medium holding computer-executable instructions for performing a method, comprising [the steps of]:

using a first set of multiple bits from header data for [an] a network layer packet as an index to locate a selected first one of the storage locations that, in combination with a second set of multiple bits from header data, provides a location of a second one of the storage locations, wherein the second one of the storage locations provides a location, in conjunction with a third set of multiple bits from the header data, of a third one of the storage locations, wherein the third one of the storage locations provides an instruction regarding how the device should forward the network layer packet; and

executing the instruction [provided by the selected storage location] to forward the  
network layer packet toward the destination.